The in 2011[90]. if a random variable t

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The problem ofapproximating the reliability and failure rate values in statisticaldistributions used to learning a certain occurrence is one of the significantproblems facing constantly those who are interested in life time data analysis.

The exponential distribution is often used in reliability theory andapplications. The cause for that it has a constant failure rate. Theexponential distribution is not guarantees to fit well a given set of realdata. Other distributions have been used in reliability theory. Some were takenfrom the twelve different forms of distributions introduced by Burr 17 tomodel data.

Among those different distributions, Burr-Type X and Burr-Type XIIreceived the most attention. There is an exhaustive analysis of Burr-Type XIIdistribution in Rodriguez 103, see also Wingo 128 for a sufficientdescription of it. Surles and Padgett 112introduced two-parameter Burr Type X distribution, which can also be describedas generalized Rayleigh distribution (GRD). It is observed that thetwo-parameter generalized Rayleigh distribution can be used quite effectivelyin modelling strength and general lifetime data. Burr Type X distribution wasalso discussed by Raqab, M Z and Kundu D 101. The parameter estimation for GRD by different method was discussed byKundu D and Raqab, M Z 68. Among the parametricmodels, the exponential distribution is perhaps the extensively realisticstatistical distribution in several fields. One of the reasons for itsprominence is that the exponential distribution has constant hazard ratefunction.

The exponentiated exponential (EE) distribution was introduced byGupta et. al. 56. Also Generalizedexponential distribution development was discussed by Gupta and Kundu 57. A new generalization ofthe exponential distribution as an alternative to the gamma, Weibull and EEdistributions was recently proposed by Nadarajah and Haghighi in 201190. If a random variable T follows Nadarajah andHaghighi (NH) distribution and it is denoted by T? NH where – scale parameter, – shape parameter. It has someinspiration properties.

The NH distribution density function can bemonotonically decreasing and yet its hazard rate function can be increasing. Thegamma, Weibull and EE distributions do not consent for an increasing hazardfunction when their respective densities are monotonically decreasing and it isrelated with the ability (or the inability) of the NH distribution to modeldata that have their mode fixed at zero. The gamma, Weibull and EEdistributions are not suitable for situations of this kind. Statisticalinference for survival data analysis, refer 76. Oxytocin is a proteinproduced by the pituitary gland of mammals including man. Pitocin is a man-madeversion of oxytocin used for stimulating contraction of the uterus. Oxytocinworks by increasing the concentration of calcium inside muscle cells thatcontrol contraction of the uterus. Increased calcium increases contraction ofthe uterus.

The FDA approvedoxytocin in November 1980, Post-delivery haemorrhage (PPH) is possibly aserious obstacle of both vaginal and caesarean delivery. The potential risks ofoxytocin boluses in women with significant cardiovascular diseases were studiedby Camann W R 21, Mayer D82.

Theprevalence of PPH is approximately 6% ofall deliveries 80. The most frequent causeof PPH is uterine atony; therefore, active management of the third stage oflabour rather than expectant management is recommended 22, 24. Currentlyvein vaccination of 5 iu of oxytocin is suggested as the prophylactic drug ofchoice to reduce the occurrence and sternness of PPH 32, 100. TheHaemodynamic effects of various types are discussed by 85, 115. In this chapter we exploretwo mathematical models using Fuzzy generalized Rayleigh distribution and FuzzyNadarajah and Haghighi distribution for the effect of Oxytocin administrationto determine the reliability (survival) and hazard rate function for differenttime intervals.
5.

1. FuzzyGeneralized Rayleigh distribution Model for Reliability5. 2.

1. Reliability function forGeneralized Rayleigh distribution A random variable T follows the GRD has the reliability function The failure rate function of GRD isgiven by There are numerousapproaches and examples in classical reliability theory, which assume that allparameters of lifetime density functions are accurate. Though, in the realityrandomness and fuzziness are often mixed up in the lifetimes of systems. But, the parameters sometimes cannot record precisely due to machine faults, trial, individual judgment, approximation or certain unexpected situations. Whenparameter in the lifetime distribution is fuzzy, the conventional reliabilitysystem may have trouble for handling reliability and failure rate functions. The theory of fuzzy reliability was proposed and development by several authorsCai and et al.

18 – 20, Karpisek, Z64, Hammer 58, Garg, H47, BalouiJamkhaneh E 37. Here we establisha fuzzy reliability model 121 using GRD. 5. 2. 2. FuzzyReliability function for Generalized Rayleigh distributionConsider GRD in fuzzyenvironment, i.

e. the fuzzy parameters swapped withthe parameters . A randomvariable T follows the fuzzy generalized distribution is denoted by . The fuzzyreliability function of the FGRD distribution is defined as The fuzzy hazard function of theFGRD distribution is defined as 5. 2.

Application for Reliability Model Considerthe experiment by Pinder. A. J. 96 discussed in section 4. 3., and the parameters for GRD for the cardiac output after10u dose of oxytocin are . The equivalent fuzzy triangular numbers are 2.

9246, 3. 6876, and 4. 4826 and 7. 2050, 8.

0600, 8. 8440. The corresponding are 2. 9246+0. 7630a, 3.

6876, 4. 4826-0. 7950a, 7. 2050+0. 8550a, 8. 0600, 8. 8440-0.

7840a. The fuzzy reliability and failure ratevalues were given the Table 5. 1. to Table 5. 4. for different time values. 5.

1. FuzzyNH Distribution ModelIn our model 121, weare investigating Nadarajah and Haghighi distribution in fuzzy environment. Thefuzzy hazard rate function and fuzzy survival function are defined for theproposed distribution. The fuzzy hazard and survival values are calculated fordifferent time intervals for the maternal heart rate effects of the women afterthe

administration of the study medicine. 5. 4. 1. NH distributionLet T be a continuous random variable with probability density function(p.

d. f.) f(t) and cumulativedistribution function (c. d. f.) , givingthe probability that the event has occurred by duration t. TheNH distribution is modest and it is raised from the exponentiated exponential(EE) distribution.

The c. d. f. of NH distribution is given by If T? NH then thedensity function of T is It will often beconvenient to work with the complement of the c. d.

f, the reliability orsurvival function this gives theprobability of survival of beyond time t. The survival function of NH distribution is obtained by An alternativecharacterization of the distribution of T is given by the hazard function isdefined as From this we get The Hazard rate function of NHdistribution is given by Resemblingto Weibull as well as EE distributions, note that the NH distribution hasclosed-form expressions for the survival and hazard rate functions. Moreover, the hazard rate function can be monotonically increasing for > 1 and monotonicallydecreasing for <1. For = 1, the hazard rate function becomesconstant. 5. 4. 2.

FuzzyNH DistributionEvery so often we facecircumstances the parameters are ambiguous. Thus we consider the NHdistribution with fuzzy parameters. The triangular fuzzy numbers are replaced inNH distribution. A random variable T follows Fuzzy NH distribution is denotedby T? FNHD . The fuzzy ofthe random variable T defined the interval c, d is as is as and compute itsa– cut as follows for all a where such that and such that . Therefore such that . The p.

d. f. of a random variable T? FNHD with fuzzy parameters is defined as follows: where .

Thefuzzy survival function is given by where such that and such that Additional fuzzyepitomizes of the lifetime distribution is the fuzzy hazard function of NHdistribution is . We propose the concept of a fuzzyhazard function based on the fuzzy probability measure and named hazard band. The fuzzy hazardrate function is given by where 5. 4. 3.

Results and ApplicationConsider the study by 85, drug was directed as an arterial bolus (delivered in 10 seconds) by the anesthetistafter the delivery of the baby. The observing and anesthetic techniques wereindistinguishable for all women. For a ? uid preload, 500 ml of 6% hydroxyethylstarch (130/0. 4) and 500 ml Ringer’s solution were administered. After thepatient had entered the operating theatre a local anesthetic (lidocainehydrochloride) was injected in preparation for spinal anaesthesia by asingle-shot technique in a sitting position. The spinal anesthetics (17 mg ofropivacaine and 20 µg of fentanyl) were injected intrathecally at L2/3.

Fluid, as well as ephedrine infusion or boluses, could be given as required to achievehaemodynamic stabilization. The caesarean techniquewas as follows. Laparotomy was performed by a modi? ed Misgav–Ladach techniqueor Pfannenstiel incision, if necessary. Following uterine incision, delivery ofthe baby, and cord clamping, the placenta was delivered by cord traction. Foruterine repair the uterus was exteriorised. The maternal heart rate (HR) after the administration of the studymedication oxytocin is shown in Fig 5.

4. 1. The shape parameter forNH distribution is = 0. 1389 and the scale parameter is = 80. 0.

The corresponding fuzzy triangular number is = 0. 1382, 0. 1389, 0.

1401 and = 78. 65, 80. 00, 81.

23. The alpha cut of the shape parameter is = 0. 1382+0. 0007a, 0. 1389, 0. 1401-0. 0012a. Likewise, the alpha cut of scaleparameter is = 78.

65+1. 35a, 80. 00, 81.

23-1. 23a. The survival rate andhazard rate after the administration of the drug oxytocin for different tvalues were shown in the Table 5. 5.

to Table 5. 8. In section 5. 3the GRD and its reliability and failure rate function was successfullyestablished in the fuzzy state.

The reliability values and failure rate valueswere calculating for the doses of 10 u oxytocin. The results show that thereliability values are decreases for lower alpha cuts and increases for upperalpha cuts. In the meantime, the failure rate values are increases for thelower alpha cuts and decreases for upper alpha cut. In section 5. 4, using the NH distribution model the fuzzy survival rate and hazard rates arecalculated. The result shows that if the survival rate increases then hazardrate decreases with respect to the time intervals. We therefore conclude thatoxytocin is uterotonic drug with an acceptable safety profile prophylactic useat the indicated doses are reduce maternal morbidity and mortality caused byPPH.